

Sixth edition
2018-03-01

AMENDMENT 1
2018-05

**Information technology — Generic
coding of moving pictures and
associated audio information —**

**Part 1:
Systems**

**AMENDMENT 1: Ultra low latency and
4k and higher resolution support for
transport of JPEG 2000 video**

ISO/IEC 13818-1:2018/Amd 1:2018

<https://standards.iteh.ai/standards/ISO/IEC/13818-1:2018/Amd-1:2018/8b15f7e1828456e14731812018-1-2018>
**Technologies de l'information — Codage générique des images
animées et du son associé —**

Partie 1: Systèmes

*AMENDEMENT 1: Support de résolution 4k et supérieure et latence
ultrafaible pour le transfert de vidéos JPEG 2000*



Reference number
ISO/IEC 13818-1:2018/Amd.1:2018(E)

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<https://standards.iteh.ai/catalog/standards/sist/bf187b89-14c1-4924-a707-8b15f7e1838e/iso-iec-13818-1-2018-amd-1-2018>



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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted.

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This document was prepared by ITU-T as Rec. ITU-T H.220.0 (03/2017) and drafted in accordance with its editorial rules. It was adopted under the JTC1 PSDO procedure by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*, in collaboration with ITU-T.

A list of all parts in the ISO/IEC 13818 series can be found on the ISO website.

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INTERNATIONAL STANDARD ISO/IEC 13818-1
RECOMMENDATION ITU-T H.222.0Information technology – Generic coding of moving pictures and
associated audio information – Part 1: Systems

Amendment 1

Ultra-low latency and 4K and higher resolution support for
transport of JPEG 2000 video

Summary

Amendment 1 to ITU-T H.222.0 (2017) | ISO/IEC 13818-1:2017 fixes interoperability issues in the transport of JPEG 2000 Part 1 (Rec. ITU-T T.800 | ISO/IEC 15444-1) by removing references to Rec. ITU-T T.800 | ISO/IEC 15444-1 Annex M and updating the definition of the elementary stream header to make it self-contained in ISO/IEC 13818-1 Annex S. It further adds support for JPEG 2000 Ultra-Low Latency (ULL) encoding and transport of professional video, audio and data over Internet Protocol networks, by specifying the use of horizontal, independent JPEG 2000 stripes. Finally, it supports higher resolutions (4K or higher) of JPEG 2000 video images by adding a new block mode. This new mode allows implementers to divide a given frame into blocks.

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History

Edition	Recommendation	ISO/IEC 13818-1:2018/Amd.1:2018	Approval	Study Group	Unique ID*
1.0	ITU-T H.222.0	https://standards.iteh.ai/catalog/standards/sist/bf157b89-1411-4102-1000/1071	1995-07-10	16	11.1002/1000/1071
1.1	ITU-T H.222.0 (1995) Amd. 1	https://standards.iteh.ai/catalog/standards/sist/1f7e1838-e196-11-4118-1-2016/amd-1-2016	1996-11-11	16	11.1002/1000/3834
1.2	ITU-T H.222.0 (1995) Amd. 2		1996-11-11	16	11.1002/1000/4096
1.3	ITU-T H.222.0 (1995) Technical Cor. 1		1998-02-06	16	11.1002/1000/4532
1.4	ITU-T H.222.0 (1995) Amd. 3		1998-02-06	16	11.1002/1000/4228
1.5	ITU-T H.222.0 (1995) Amd. 4		1998-02-06	16	11.1002/1000/4229
1.6	ITU-T H.222.0 (1995) Amd. 5		1999-05-27	16	11.1002/1000/4498
1.7	ITU-T H.222.0 (1995) Amd. 6		1999-05-27	16	11.1002/1000/4671
2.0	ITU-T H.222.0		2000-02-17	16	11.1002/1000/5142
2.1	ITU-T H.222.0 (2000) Technical Cor. 1		2001-03-01	16	11.1002/1000/5419
2.2	ITU-T H.222.0 (2000) Technical Cor. 2		2002-03-29	16	11.1002/1000/5675
2.3	ITU-T H.222.0 (2000) Amd. 1		2002-12-14	16	11.1002/1000/6190
2.4	ITU-T H.222.0 (2000) Amd. 1/Cor. 1		2003-06-29	16	11.1002/1000/6449
2.5	ITU-T H.222.0 (2000) Amd. 2		2003-06-29	16	11.1002/1000/6363
2.6	ITU-T H.222.0 (2000) Amd. 3		2004-03-15	16	11.1002/1000/7208
2.7	ITU-T H.222.0 (2000) Technical Cor. 3		2005-01-08	16	11.1002/1000/7435
2.8	ITU-T H.222.0 (2000) Amd. 4		2005-01-08	16	11.1002/1000/7436
2.9	ITU-T H.222.0 (2000) Amd. 5		2005-01-08	16	11.1002/1000/7437
2.10	ITU-T H.222.0 (2000) Technical Cor. 4		2005-09-13	16	11.1002/1000/8560
3.0	ITU-T H.222.0		2006-05-29	16	11.1002/1000/8802
3.1	ITU-T H.222.0 (2006) Amd. 1		2007-01-13	16	11.1002/1000/9024
3.2	ITU-T H.222.0 (2006) Amd. 2		2007-08-29	16	11.1002/1000/9214

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

ISO/IEC 13818-1:2018/Amd.1:2018(E)

3.3	ITU-T H.222.0 (2006) Cor. 1	2008-06-13	16	11.1002/1000/9471
3.4	ITU-T H.222.0 (2006) Cor. 2	2009-03-16	16	11.1002/1000/9692
3.5	ITU-T H.222.0 (2006) Amd. 3	2009-03-16	16	11.1002/1000/9691
3.6	ITU-T H.222.0 (2006) Cor. 3	2009-12-14	16	11.1002/1000/10621
3.7	ITU-T H.222.0 (2006) Cor. 4	2009-12-14	16	11.1002/1000/10622
3.8	ITU-T H.222.0 (2006) Amd. 4	2009-12-14	16	11.1002/1000/10623
3.9	ITU-T H.222.0 (2006) Amd. 5	2011-05-14	16	11.1002/1000/11287
3.10	ITU-T H.222.0 (2006) Amd. 6	2011-05-14	16	11.1002/1000/11288
4.0	ITU-T H.222.0	2012-06-29	16	11.1002/1000/11655
4.1	ITU-T H.222.0 (2012) Amd. 1	2014-01-13	16	11.1002/1000/12054
4.2	ITU-T H.222.0 (2012) Amd. 2	2014-01-13	16	11.1002/1000/12055
4.3	ITU-T H.222.0 (2012) Amd. 3	2014-01-13	16	11.1002/1000/12056
4.4	ITU-T H.222.0 (2012) Amd. 4	2014-01-13	16	11.1002/1000/12057
4.5	ITU-T H.222.0 (2012) Amd. 5	2014-10-14	16	11.1002/1000/12306
5.0	ITU-T H.222.0	2014-10-14	16	11.1002/1000/12359
5.1	ITU-T H.222.0 (2014) Amd. 1	2015-04-29	16	11.1002/1000/12452
5.2	ITU-T H.222.0 (2014) Amd. 1 Cor. 1	2015-11-29	16	11.1002/1000/12625
5.3	ITU-T H.222.0 (2014) Amd. 2	2015-12-14	16	11.1002/1000/12632
5.4	ITU-T H.222.0 (2014) Amd. 3	2015-12-14	16	11.1002/1000/12633
5.5	ITU-T H.222.0 (2014) Amd. 1 Cor. 2	2016-07-14	16	11.1002/1000/12899
5.5	ITU-T H.222.0 (2014) Cor. 1	2016-07-14	16	11.1002/1000/12903
5.7	ITU-T H.222.0 (2014) Amd. 4	2016-07-14	16	11.1002/1000/12900
5.8	ITU-T H.222.0 (2014) Amd. 5	2016-07-14	16	11.1002/1000/12901
5.9	ITU-T H.222.0 (2014) Amd. 6	2016-07-14	16	11.1002/1000/12902
5.10	ITU-T H.222.0 (2014) Amd. 3 Cor. 1	2017-03-01	16	11.1002/1000/13184
5.10	ITU-T H.222.0 (2014) Cor. 2	2017-03-01	16	11.1002/1000/13188
5.12	ITU-T H.222.0 (2014) Amd. 7	2017-03-01	16	11.1002/1000/13186
5.13	ITU-T H.222.0 (2014) Amd. 8	2017-03-01	16	11.1002/1000/13187
6.0	ITU-T H.222.0	2017-03-01	16	11.1002/1000/13269
6.0	ITU-T H.222.0 (2017) Amd. 1	2017-12-14	16	11.1002/1000/13431

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

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<https://standards.iteh.ai/catalog/standards/sist/bf187b89-14c1-4924-a707-8b15f7e1838e/iso-iec-13818-1-2018-amd-1-2018>

INTERNATIONAL STANDARD
ITU-T RECOMMENDATIONInformation technology – Generic coding of moving pictures and
associated audio information – Part 1: Systems

Amendment 1

Ultra-low latency and 4K and higher resolution support for
transport of JPEG 2000 video

1) Clause 2.1.69

Replace 2.1.69 with the following:

2.1.69 JPEG 2000 (J2K) video access unit: The JPEG 2000 codestream or codestreams comprising a decodable and randomly accessible (portion of) image, preceded by all the parameters required to decode the access unit and display the decoded data.

2) New clauses 2.1.70, 2.1.71, 2.1.73, 2.1.74

Add new 2.1.70, 2.1.71, 2.1.73, 2.1.74 and update other subclause numbering accordingly:

2.1.70 J2K block: The JPEG 2000 codestream or codestreams corresponding to a rectangular portion of a video frame, as detailed in S.3.

NOTE – Usage of J2K blocks requires J2K block mode (defined in 2.1.71) to be enabled in the J2K video descriptor. Such usage facilitates the support of 4k and higher resolutions.

2.1.71 J2K block mode: Optional mode defined in S.3, dividing each frame of a J2K video stream in a certain amount of rectangular blocks, each encoded as an independent J2K block (defined in 2.1.70).

2.1.73 J2K stripe: The JPEG 2000 codestream or codestreams comprising a decodable horizontally divided portion of an image, as detailed in S.4.

NOTE – Usage of J2K stripes requires J2K stripe mode (defined in 2.1.74) to be enabled in the J2K video descriptor. Such usage enables transport of a J2K video stream with a low end-to-end latency.

2.1.74 J2K stripe mode: Optional mode defined in S.4, dividing the (portion of) image transported in a J2K video access unit in a succession of horizontal stripes, each encoded as an independent J2K stripe (defined in 2.1.73).

3) Clause 2.6.80

Replace Table 2-99 with the following:

Table 2-99 – J2K video descriptor

Syntax	No. of bits	Mnemonic
J2K_video_descriptor() {		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
extended_capability_flag	1	bslbf
profile_and_level	15	bslbf
horizontal_size	32	uimsbf
vertical_size	32	uimsbf
max_bit_rate	32	uimsbf
max_buffer_size	32	uimsbf
DEN_frame_rate	16	bslbf
NUM_frame_rate	16	bslbf
if (extended_capability_flag == '1') {		

Table 2-99 – J2K video descriptor

Syntax	No. of bits	Mnemonic
stripe_flag	1	bslbf
block_flag	1	bslbf
mdm_flag	1	bslbf
reserved (all bits to be set to '0')	5	bslbf
} else {		
color_specification	8	bslbf
}		
still_mode	1	bslbf
interlaced_video	1	bslbf
reserved	6	bslbf
if (extended_capability_flag == '1') {		
colour_primaries	8	uimsbf
transfer_characteristics	8	uimsbf
matrix_coefficients	8	uimsbf
video_full_range_flag	1	bslbf
reserved	7	bslbf
if (stripe_flag == '1') {		
strp_max_idx	8	uimsbf
strp_height	16	uimsbf
}		
if (block_flag == '1') {		
full_horizontal_size	32	uimsbf
full_vertical_size	32	uimsbf
blk_width	16	uimsbf
blk_height	16	uimsbf
max_blk_idx_h	8	uimsbf
max_blk_idx_v	8	uimsbf
blk_idx_h	8	uimsbf
blk_idx_v	8	uimsbf
}		
if (mdm_flag == '1') {		
X_c0, Y_c0, X_c1, Y_c1, X_c2, Y_c2	16x6	uimsbf
X_wp	16	uimsbf
Y_wp	16	uimsbf
L_max	32	uimsbf
L_min	32	uimsbf
MaxCLL	16	uimsbf
MaxFALL	16	uimsbf
}		
for (i=0; i<N; i++) {		
private_data_byte	8	bslbf
}		

4) Clause 2.6.81

Replace 2.6.81 with the following:

2.6.81 Semantics of fields in J2K video descriptor

extended_capability_flag – This 1-bit field indicates that the J2K video stream uses extended color specification (through three bytes defining the chromaticity parameters, as described below), and that it might have one or several of the following capabilities enabled: stripes (through the J2K stripe mode), blocks (through the J2K block mode), or inclusion of mastering display metadata. The exact list of enabled capabilities is set through subsequent flags in the video descriptor (see below).

profile_and_level – This 15-bit field shall correspond to the 15 least significant bits of the 2-bytes Rsiz value included in all J2K codestream main headers of this J2K video stream. Rsiz values that are defined in Table A.10 of Rec. ITU-T T.800 | ISO/IEC 15444-1 and do set to '0' their most significant bit are allowed.

NOTE – the combination of the `extend_capability_flag` and the `profile_and_level` field ensures backward and forward compatibility with legacy devices conforming to previous versions of this Recommendation | International Standard. Having the `extended_capability_flag` set to '1' leads indeed to a 16-bit value outside the range accepted by previous versions of this Recommendation | International Standard. This way, J2K video streams with extended capabilities can be unequivocally identified by both legacy and new devices.

horizontal_size – This 32-bit field indicates the horizontal size of the frame (for progressive) or field (for interlaced) comprised in each J2K access unit. If J2K block mode is enabled, this frame or field corresponds to a spatial rectangular block of the entire video frame or field. It shall be coded the same as the Xsiz parameter found in all J2K codestream main headers of this J2K video stream, as defined in Annex A of Rec. ITU-T T.800 | ISO/IEC 15444-1.

vertical_size – This 32-bit field indicates the vertical size of the frame (for progressive) or field (for interlaced) comprised in each J2K access unit. If J2K block mode is enabled, this frame or field corresponds to a spatial rectangular block of the entire video frame or field. If J2K stripe mode is disabled, it shall be coded the same as the Ysiz parameter found in all J2K codestream main headers of this J2K video stream. If J2K stripe mode is enabled, it shall be coded as the sum of the Ysiz parameters found in all J2K codestreams composing the frame (for progressive) or a field (for interlaced) comprised in each J2K access unit. Ysiz parameters are defined in Annex A of Rec. ITU-T T.800 | ISO/IEC 15444-1.

max_bit_rate – This field may be coded the same as the `brat_max_br` field specified in Table S.1 and shall not exceed the maximum compressed bit rate value for the profile and level specified in Table S.2. This field shall be set appropriately and signalled when `profile_and_level` = '000 0011 0000 0111', where no maximum bit rate is specified.

max_buffer_size – This field shall not exceed the Maximum buffer size value for the profile and level specified in Table S.2. When `profile_and_level` = '000 0011 0000 0111', the `max_buffer_size` shall be set appropriately and shall not exceed (`max_bit_rate`/1.60E5), where `max_bit_rate` is expressed in bit/s.

DEN_frame_rate – This field shall be coded the same as `frat` denominator field specified in Table S.1 (see Annex S).

NUM_frame_rate – This field shall be coded the same as `frat` numerator field specified in Table S.1 (see Annex S).

NOTE – J2K frame rate is derived from the `DEN_frame_rate` and `NUM_frame_rate` values. Table 2-100 lists examples of typical broadcast frame rates with associated values of `DEN_frame_rate` and `NUM_frame_rate`.

Table 2-100 – Example frame rates based on `DEN_frame_rate` and `NUM_frame_rate` values

DEN_frame_rate	NUM_frame_rate	Frame rate ratio (decimal representation)	Frame rate
0000 0000 0000 0000			Forbidden
0000 0011 1110 1001	0101 1101 1100 0000	24 000 / 1001	23.976
0000 0000 0000 0001	0000 0000 0001 1000	24 / 1	24.0
0000 0000 0000 0001	0000 0000 0001 1001	25 / 1	25.0
0000 0011 1110 1001	0111 0101 0011 0000	30 000 / 1001	29.97
0000 0000 0000 0001	0000 0000 0001 1110	30 / 1	30.0
0000 0000 0000 0001	0000 0000 0011 0010	50 / 1	50.0
0000 0011 1110 1001	1110 1010 0110 0000	60 000 / 1001	59.94
0000 0000 0000 0001	0000 0000 0011 1100	60 / 1	60.00

stripe_flag – This 1-bit field is included only if the `extended_capability_flag` is set to '1'. It indicates whether the J2K video stream has J2K stripe mode enabled. When this flag is set to '1' the J2K access unit elementary stream header (see Table S.1) shall not include the syntax element `j2k_tcod`, shall include the syntax element `j2k_strp`, and the corresponding J2K access unit shall be made of a succession of J2K stripes. When this flag is set to '0', the J2K access unit elementary stream header shall include the syntax element `j2k_tcod`, shall not include the syntax element `j2k_strp`, and the corresponding J2K access unit shall be made of one J2K codestream in case of progressive content and two J2K codestreams in case of interlaced content.

block_flag – This 1-bit field is included only if the `extended_capability_flag` is set to '1'. When set to '1', it indicates that the J2K video stream has J2K block mode enabled, meaning that this J2K video stream actually corresponds to a spatial rectangular block of the full video stream. Subdivision of each frame into rectangular independent blocks is further defined in Section S.3. When set to '0', then the associated J2K video stream shall not have J2K block mode enabled.